Synoptic Characterization of the Southwest Atlantic Shelf

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NRL Code 7332, Stennis Space Center, MS 39529
Award Number: N00014-01-1-4063

LONG-TERM GOALS

To develop and conduct a scientific program to be carried out as a multinational cooperation effort by the Naval Research Laboratory and institutions in Argentina, Brazil and Uruguay.

OBJECTIVES

The main scientific objective of this project is to characterize the seasonal variations of the Plata plume and the Subtropical Shelf Front (STSF) off southeastern South America (Fig. 1) and their impact on the circulation and on the chemical and biological processes of the continental shelf. This will include the determination of the relative importance of the main forcing factors on the distribution of the low salinity waters derived from the Rio de la Plata and the Patos Lagoon.

APPROACH

To attain our objective, we propose to conduct two field experiments, one in Austral winter and one in summer (see Figure 1). Each survey will combine airborne salinity measurements and in situ three-dimensional determination of physical, biological and chemical water mass properties. The surveys will collect the first quasi-synoptic and multidisciplinary set of observations of the low salinity plume, the STSF, and the background water masses. Satellite remote sensing of sea surface temperature and color and modeling will complement the above surveys.

The key South American individuals participating in this work and their roles are:

Edmo J. D. Campos	University of Sao Paulo, Brazil	Modeling and Data Analysis
Carlos R. Martinez	Universidad de la Republica, Uruguay	Remote sensing, AVHRR and local coordination of airborne survey.
Osmar O. Moller Jr.	Fundacao Universidade do Rio Grande	In situ survey: Hydrography and current measurements;
Alberto R. Piola	Servicio de Hidrografia Naval, Argentina	In situ survey: Hydrography and current measurements.

The U.S. key participant will be Jerry L. Miller, from the Naval Research Laboratory, who will coordinate the airborne component.

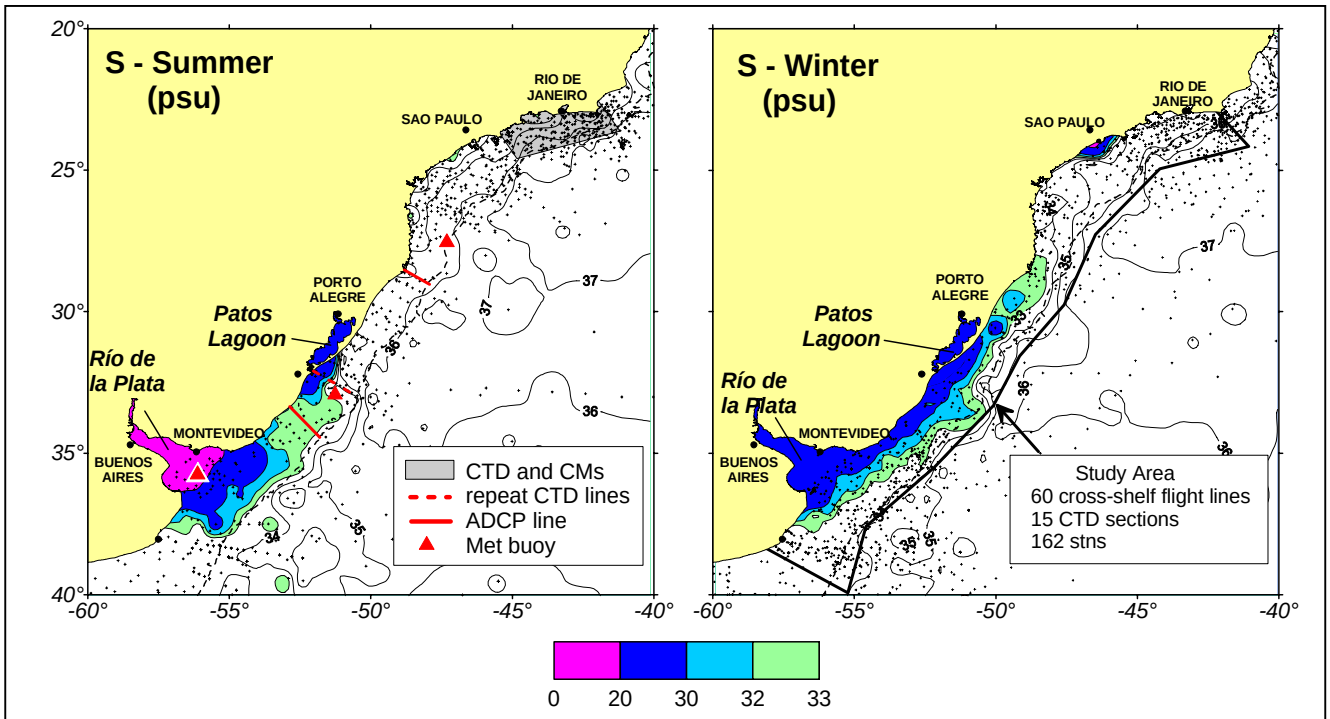

Figure 8: Summer (left panel) and winter (right panel) sea surface salinity distributions off northern Argentina, Uruguay and southern Brazil. Note the northward extension of the Río de la Plata plume during winter. The maps are climatologies based on all available high quality historical data. Small crosses indicate station positions. On the left panel the location of in situ observations that will be in place as part of ongoing or already funded research are indicated. The study area of the present proposal is indicated in the right panel. The dashed line is the 200-meter isobath, which marks the outer edge of the continental shelf.

TRAVEL COMPLETED

Table 1. Summary of visits conducted under this VSP.

Person Visited	Position	Institution / Conference	Location	Scientific / Technical Purpose	Dates (mm/dd/yy format)
Jerry L. Miller		NRL/SSC	Bay St.Louis, Mississipi	Proposal preparation	From 06/24/2001 To 06/29/2001

RESULTS

During the visit to NRL, a scientific project for a large scale survey of the Rio de la Plata salinity plume along the southeastern South American Continental shelf was structured. As planned, at the end, the elements for a proposal to NICOP were submitted in a document to the U.S. colleague.

A seminar entitled "**The impact of the Plata discharge over the adjacent continental shelf**" was presented by the visitor Alberto R. Piola. An abstract of this talk is attached as an appendix.

IMPACT/APPLICATIONS

The airborne salinity measurements are a key point of the proposed project. These measurements will allow a detailed synoptic mapping of the distribution of low salinity water over the shelf. Combined with in situ measurements, the first synoptic three-dimensional picture of the freshwater discharge and its interaction with the background shelf waters will be obtained. The project will also provide access of this new technology to several South American institutions and will become a reference for future multidisciplinary research of coastal density driven flows.

The Navy requires knowledge of littoral currents that affect operations ranging from special operations to mine counter measures. This project will extend NRL's investigations of buoyancy-driven coastal currents to new dynamical regimes not addressable within the context of ongoing research programs. These currents can exceed 2 knots and can strongly affect operations in the small and medium sizes coastal systems that NRL has investigated. The fresh water discharge of the Rio de la Plata onto the Southwest Atlantic continental shelf is several times larger than any system previously studied. At present, NRL's ability to predict currents, density structure, and buoyancy distributions in such a system is unknown. Simply scaling up characteristics of smaller systems is highly unlikely to be appropriate. This NICOP project presents NRL with a very low cost opportunity to fill this knowledge gap.

TRANSITIONS

(a) The better knowledge of the water mass properties and dynamics of the coastal waters off eastern South America will benefit both naval and civilian communities in the region and will certainly provide important strategical information to the U.S. Navy.
(b) Since the realm of the pelagic environment is closely related to the dynamics of the water structure and the life cycle of planktonic organisms is controlled by horizontal and vertical water exchange, the knowledge of changes in water mass distribution and stratification is crucial for the development of fisheries and coastal management policies.

RELATED PROJECTS

SACC/CRN – The South Atlantic Climate Change. A Cooperative Research Network for the Study of Global and Climate Changes in the South Atlantic see http://glaucus.fcien.edu.uy/pcmya/sacc/

PUBLICATIONS

Campos, E.J.D., C.A.D. Lentini, J.L. Miller and A.R. Piola, 1999, Interannual variability of the sea surface temperature in the South Brazil Bight, *Geophys. Res. Lett.*, 26, 2061-2064.

Lentini, G. Podesta, D.B. Olson and E.J. Campos. (2001) SST anomalies in the Western South Atlantic Ocean - 1982 to 1994. *Cont. Shelf Res*. 21 (2001) 89-112.

Miller, J.L., D. Johnson, F. Pimenta and E. Campos, 2001. Effects of varying winds and river discharge on a large coastal buoyancy jet. *The Oceanography Society Meeting*, Miami, April 2001.

Piola, A.R., E.J.D. Campos, O.O. Moller, M.Charo and C. Martinez, 2000, Subtropical shelf front off eastern South America, *Journal of Geophysical Research*, 105, C3, 6565-6578.

Zavialov, P., O.O.Möller Jr., E.J.D. Campos, First direct measurements of currents on the shelf of Southern Brazil. *Cont. Shelf Res.* (in press).